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More Market, Less Poverty, But Also More Sustainable Land Use?

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Abstract

The main question in this research is to what extent agriculture on fragile slopes would become more sustainable if the farmers were given more possibilities for selling their products and acquiring production resources. An empirical study conducted in northern Benin demonstrates that a more accessible market does not lead to substantial increase in soil erosion control measures. The results indicated clearly that a closer market has positive effects on the yields of grain, and provides farmers with more opportunities to grow other, more commercial, crops or to undertake other profitable activities. Investments in an improved infrastructure can therefore contribute to improved agricultural returns, and these higher returns increase the attractiveness of soil conservation.

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Introduction

In many underdeveloped parts of developing countries, cultivation on fragile slopes is common. Sustainable land use is therefore important so that, for example, soil erosion does not lead to further poverty. The question that has been studied in this research is to what extent a more accessible market would increase soil erosion control measures. The study is based on empirical data from Boukombe in the northwest of Benin.

Study approach

The study approach has three steps: data collection, estimation and simulation.

Data collection

Micro data were collected in four villages in the district of Boukombe within the framework of the program entitled Agricultural Transition towards Sustainable Tropical Land Use sponsored by the Netherlands Organisation for Scientific Research. Most information on production decisions and soil erosion control were collected at the plot level. Surveys were carried out in July-August 1998 and January-February 1999. The study sample includes 101 randomly selected farm households encompassing 524 plots. Market access was measured using travel time by foot from the farmer's house to the main market.

Estimation

The main models were the models for the use of household production resources; the impact of market access was derived based on them. Markets don't function very well in the Boukombe region; prices may be distorted. In the data a substantial gap was found between the marginal product of labour (the main household production resource) and the market wage rate, contrary to what economic theory says; this probably reflects market distortions. It has been asserted that a large part of the gap found may be explained by the level of market access. Therefore an adjusted estimation procedure was proposed in order to estimate the use of peasant resources and infer the effect of market access. The following steps were adopted:

(1) estimate econometrically the effect of travel time on the wage distortion factor. This is the main estimation model. An OLS regression was performed with correction for misspecification problems. The wage distortion factor is the ratio of the physical marginal product of labour to the relative market wage. The physical marginal product, also known as the shadow wage, was derived from an estimated production function using data from grain plots;

(2) estimate a reduced-form model for the use of mineral fertilizer; the level of mineral fertilizer applied per grain plot is associated to travel time and control variables. A censored regression model was performed;

(3) two reduced-form models that associate travel time to production opportunities other than grain production:

- for the cultivation of more commercial crops, an OLS regression was applied;
- for participation in non-farm production, a logit model was estimated.

Simulation

Simulations were carried out where it was proposed, for example, to bring all farm households close to the market; travel time is kept at a level that is not higher than 30 minutes.

(1) The models for the wage distortion factor and for the use of mineral fertilizer were used to infer new levels for labour and mineral fertilizer application; and a new level of the grain output was simulated.

(2) Changes in the grain output were compared for plots 'without' and 'with' a soil erosion control measure; if the change in the grain output is higher on plots 'with', then soil erosion control measures increase with lower travel time.

Study context

Boukombe is one of the poorest regions of Benin. The area is isolated from major cities, having lowest road density. Biophysical conditions are difficult. The area is mountainous. Rains are heavier in recent years leading to more soil erosion problems. In the 1950s soil scientists projected spreading of starvation in Boukombe. No visible signs of large-scale starvation are observed these days although malnutrition is more widespread in the region than in other parts of Benin. Farmers have adopted various measures for soil erosion control and for reducing soil fertility decline. As a result food output was more or less stabilized (pictures will be made available at the presentation on the study context).

Findings

The estimation results confirm that the association between the wage distortion factor, and hence the shadow wage, and travel time is negative as expected. Farmers in remote areas use a few, if any, external yield-enhancing inputs (e.g. mineral fertilizers); in replacement they use more labour in order to stabilize grain output, pushing down the marginal productivity of labour (i.e. the shadow wage). The simulation results show that the effects of a closer market on erosion control are marginal although it clearly induces higher incomes in Boukombe. The study has made it clear that reducing the distance to the market has slight, but positive, effects on the yields of grains. A more accessible market also provides households with more opportunities to grow other, more commercial, crops or to undertake other profitable activities.

Conclusion

A closer market does not lead to a substantial increase in soil erosion control measures in the northwest of Benin. However, it leads to higher factor productivity (labour, land) in the grain sector. Further, it provides stronger incentives to grow other, more commercial, crops and to undertake other profitable investments. Investments in an improved infrastructure can therefore lead to higher returns, and these higher returns induce farmers to invest more in the sustainable use of slopes.